Unit: Quantitative Chemistry	
IB Expectations/ Assessment Criteria	
DP Group 4:Chemistry, DP - Age 16-18, Objectives It is the intention of all the Diploma Programme experimental science courses that students achieve the following objectives. ▪ 1. Demonstrate an understanding of: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology d. methods of presenting scientific information. ▪ 2. Apply and use: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology to communicate effectively d. appropriate methods to present scientific information. ▪ 3. Construct, analyse and evaluate: a. hypotheses, research questions and predictions b. scientific methods and techniques c. scientific explanations. ▪ 4. Demonstrate the personal skills of cooperation, perseverance and responsibility appropriate for effective scientific investigation and problem solving. ▪ 5. Demonstrate the manipulative skills necessary to carry out scientific investigations with precision and safety.	
Approach	**Significant concept(s) / Considerations**
Practice driven since the topic is mathematical.	Mole and Stoichiometry. Gas laws.
Guiding Questions	**Learner Profile**
Which unit of measurement is the most appropriate to be used in Chemistry?	▪ Thinkers ▪ Principled ▪ Balanced ▪ Reflective
Central Idea / Content	**Learning Objectives**
The mole concept and Avogadro's constant Formulas Chemical equations Mass and gaseous volume relationships in chemical reactions	Apply the mole concept to substances. Determine the number of particles and the amount of substances (in moles). Define the terms relative atomic mass (Ar) and relative molecular

Solutions.	mass (Mr) Calculate the mass of one mole of a species from its formula. Solve problems involving the relationship between the amount of substance in moles, mass and molar mass. Distinguish between the terms empirical formula and molecular formula. Determine the empirical formula from the percentage composition or from other experimental data. Determine the molecular formula when given both the empirical formula and experimental data. Deduce chemical equations when all reactants and products are given. Identify the mole ratio of any two species in a chemical equation. Apply the state symbols (s), (l), (g) and (aq). Calculate theoretical yield from chemical equations Determine the limiting reactant and the reactant in excess when quantities of reacting substances are given. Solve problems involving theoretical, experimental and percentage yield. Apply Avogadro's law to calculate reacting volume of gases. Apply the concept of molar volume at standard temperature and pressure in calculations. Solve problems involving the relationship between temperature, pressure and volume for a fixed mass of an ideal gas. Solve problems using the ideal gas equation, $PV = nRT$. Analyse graphs relating to the ideal gas equation. Distinguish between the terms solute, solvent, solution and concentration (g dm-3 and mol dm-3) Solve problems involving concentration, amount of solute and volume of solute.

Assessment	

Worksheets/Assignments
Summative: Other Written Assessment
Worksheets to assess the students' learning on a daily basis.

Quizzes and a unit Test
Summative: Standardized Test
Quizzes to be given on a regular basis and a unit test to be taken.

Labs
Summative: Lab Assignment
Several labs to be done on DCP.

Information Literacy & ICT	International Mindedness	TOK
Use of computers to generate and analyze gas graphs.	The unit of measurement has to be international to bring about uniformity of concepts and ideas.	Assigning numbers to the masses of the chemical elements allowed chemistry to develop into a physical science and use mathematics to express relationships between reactants and products.

Strategies / Activities / Differentiation	Resources
Extra classes for students needing inputs.	Chemistry Course Companion Teacher assisted learning materials Independent research instruments Worksheets

Unit Reflections

Unit: Atomic Structure

IB Expectations/ Assessment Criteria

DP Group 4:Chemistry, DP - Age 16-18, Objectives

It is the intention of all the Diploma Programme experimental science courses that students achieve the following objectives.

- 1. Demonstrate an understanding of: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology d. methods of presenting scientific information.
- 2. Apply and use: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology to communicate effectively d. appropriate methods to present scientific information.
- 3. Construct, analyse and evaluate: a. hypotheses, research questions and predictions b. scientific methods and techniques c. scientific explanations.
- 4. Demonstrate the personal skills of cooperation, perseverance and responsibility appropriate for effective scientific investigation and problem solving.
- 5. Demonstrate the manipulative skills necessary to carry out scientific investigations with precision and safety.

Approach	**Significant concept(s) / Considerations**
	Atoms are the building blocks of all matter.
Guiding Questions	**Learner Profile**
Is our study of atoms complete?	▪ Inquirers ▪ Communicators ▪ Open-minded
Central Idea / Content	**Learning Objectives**
Structure of atom.	Position of protons, neutrons and electrons in the atom. Relative masses and relative charges of protons, neutrons and electrons. Define mass number (A), atomic number (Z) and isotopes of an element. Symbol for an isotope given its mass number and atomic number (example 126C).

	Calculate the number of protons, neutrons, and electrons in atoms and ions from the mass number, atomic number and charge. Compare the properties of the isotopes of an element. Discuss the uses of radioisotopes. Describe and explain the operation of a mass spectrometer – vaporization, ionization, acceleration, deflection and detection. How the mass spectrometer can be used to determine relative atomic mass using the 12C scale. Calculate the non integer relative atomic masses and abundance of isotopes from given data. Describe the electromagnetic spectrum. Distinguish between a continuous spectrum and a line spectrum. How the lines in the emission spectrum of hydrogen are related to electron energy levels. Deduce the electron arrangement for atoms and ions upto Z = 20.

Assessment

A unit Test
Summative: Standardized Test
A unit test done.

Information Literacy & ICT	**International Mindedness**	**TOK**
Research using internet.	Appreciate the contribution of chemists from around the world in trying to understand the structure of an atom.	What is the significance of the model of the atom in the different areas of knowledge?

Strategies / Activities / Differentiation	**Resources**
Extra support lessons for students with learning difficulties.	Chemistry Course Companion Teacher assisted learning materials Independent research instruments

	Worksheets

Unit Reflections

Taken by Mr. Joshi. Some topic like spectrometer and spectrum had to be retaught. The students are now better.

Unit: Periodicity	
IB Expectations/ Assessment Criteria	
DP Group 4:Chemistry, DP - Age 16-18, Objectives It is the intention of all the Diploma Programme experimental science courses that students achieve the following objectives. ▪ 1. Demonstrate an understanding of: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology d. methods of presenting scientific information. ▪ 2. Apply and use: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology to communicate effectively d. appropriate methods to present scientific information. ▪ 3. Construct, analyse and evaluate: a. hypotheses, research questions and predictions b. scientific methods and techniques c. scientific explanations. ▪ 4. Demonstrate the personal skills of cooperation, perseverance and responsibility appropriate for effective scientific investigation and problem solving. ▪ 5. Demonstrate the manipulative skills necessary to carry out scientific investigations with precision and safety.	
Approach	**Significant concept(s) / Considerations**
Activity based learning of trends.	Trends in the periodic table.
Guiding Questions	**Learner Profile**
What are the trends in the modern day periodic table?	▪ Thinkers ▪ Communicators ▪ Reflective
Central Idea / Content	**Learning Objectives**
3.1 The Periodic table 3.2 Physical properties 3.3 Chemical properties 13.1 Trends across period 3 13.2 First row d-block elements	Describe the arrangement of elements in the periodic table in order of increasing atomic number. Distinguish between the terms *group* and *period.* Apply the relationship between the electron arrangement of elements and their position in the periodic table up to $Z = 20$. Apply the relationship between the number of electrons in the highest occupied energy level for an element and its position in the

	periodic table. Define the terms *first ionization energy* and *electronegativity*. Describe and explain the trends in atomic radii, ionic radii, first ionization energies, electronegativities and melting points for the alkali metals (Li à Cs) and the halogens (FàI). Describe and explain the trends in atomic radii, ionic radii, first ionization energies and electronegativities for elements across period 3. Compare the relative electronegativity values of two or more elements based on their positions in the periodic table. Discuss the similarities and differences in the chemical properties of elements in the same group. Discuss the changes in nature, from ionic to covalent and from basic to acidic, of the oxides across period 3. AHL Explain the physical states (under standard conditions) and electrical conductivity (in the molten state) of the chlorides and oxides of the elements in period 3 in terms of their bonding and structure. Describe the reactions of chlorine and the chlorides referred to in 13.1.1 with water. List the characteristic properties of transition elements. Explain why Sc and Zn are not considered to be transition elements. Explain the existence of variable oxidation number in ions of transition elements. Define the term *ligand*. Describe and explain the formation of complexes of d-block elements. Explain why some complexes of d-block elements are coloured. State examples of the catalytic action of transition elements and their compounds. Outline the economic significance of catalysts in the Contact and Haber processes.

<u>**Assessment**</u>

Worksheets/Assignments
Summative: Other Written Assessment
Worksheets to assess students' learning on a daily basis.

Quizzes and a unit Test.
Summative: Standardized Test
Several quizzes and a test will be taken.

Labs
Summative: Lab Assignment
Focussing on DCP.

Information Literacy & ICT	**International Mindedness**	**TOK**
Developing a highly efficient link based periodic table.	Is the periodic table uniform across the world? Why?	The early discovers of the elements allowed chemistry to make great steps with limited apparatus, often derived from the pseudoscience of alchemy. Lavoisier's work with oxygen, which overturned the phlogiston theory of heat, could be discussed as an example of paradigm shift.

Strategies / Activities / Differentiation	**Resources**
Students with learning difficulty will made a shorter version of coloured periodic table giving the trends. The definitions will be made lighter.	Chemistry Course Companion Teacher assisted learning materials Independent research instruments Worksheets.

Unit Reflections
The unit is incomplete at the end of the semester.

Unit: Bonding	
IB Expectations/ Assessment Criteria	
DP Group 4:Chemistry, DP - Age 16-18, Aims All the Diploma Programme experimental science courses should aim to: ▪ 1. provide opportunities for scientific study and creativity within a global context that will stimulate and challenge students ▪ 2. provide a body of knowledge, methods and techniques that characterize science and technology ▪ 3. enable students to apply and use a body of knowledge, methods and techniques that characterize science and technology ▪ 4. develop an ability to analyse, evaluate and synthesize scientific information ▪ 5. engender an awareness of the need for, and the value of, effective collaboration and communication during scientific activities ▪ 6. develop experimental and investigative scientific skills ▪ 7. develop and apply the students' information and communication technology skills in the study of science ▪ 8. raise awareness of the moral, ethical, social, economic and environmental implications of using science and technology ▪ 9. develop an appreciation of the possibilities and limitations associated with science and scientists ▪ 10. encourage an understanding of the relationships between scientific disciplines and the overarching nature of the scientific method.	
Approach	**Significant concept(s) / Considerations**
Project based learning of bonding.	Ionic and Covalent bonding Intermolecular forces and metallic bonds.
Guiding Questions	**Learner Profile**
Why do atoms bind?	▪ Inquirers ▪ Communicators ▪ Open-minded ▪ Balanced ▪ Reflective
Central Idea / Content	**Learning Objectives**
4.1 Ionic bonding 4.2 Covalent bonding	Describe the ionic bond as the electrostatic attraction between oppositely charged ions.

4.3 Intermolecular forces 4.4 Metallic bonding 4.5 Physical properties 14.1 Shapes of molecules and ions 14.2 Hybridization 14.3 Delocalization of electrons	How ions can be formed as a result of electron transfer. Which ions will be formed when elements in groups 1, 2 and 3 lose electrons? Which ions will be formed when elements in groups 5, 6 and 7 gain electrons? State transition elements can form more than one ion. Predict whether a compound of two elements would be ionic from the position of the elements in the periodic table or from their electronegativity values. State the formula of common polyatomic ions formed by nonmetals in periods 2 and 3. Describe the lattice structure of ionic compounds. Describe the covalent bond as the electrostatic attraction between a pair of electrons and positively charged nuclei. Describe how the covalent bond is formed as a result of electron sharing. Deduce the Lewis (electron dot) structures of molecules and ions for up to four electron pairs on each atom. State and explain the relationship between the number of bonds, bond length and bond strength. Predict whether a compound of two elements would be covalent from the position of the elements in the periodic table or from their electronegativity values. Predict the relative polarity of bonds from electronegativity values Predict the shape and bond angles for species with four, three and two negative charge centres on the central atom using the valence shell electron pair repulsion theory (VSEPR). Predict whether or not a molecule is polar from its molecular shape and bond polarities. The structure and bonding in the three allotropes of carbon (diamond, graphite and C**60**fullerene). Describe the structure of and bonding in silicon and silicon dioxide.

	Describe the types of intermolecular forces (attractions between molecules that have temporary dipoles, permanent dipoles or hydrogen bonding) and explain how they arise from the structural features of molecules. Describe and explain how intermolecular forces affect the boiling points of substances. Describe the metallic bond as the electrostatic attraction between a lattice of positive ions and delocalized electrons. Explain the electrical conductivity and malleability of metals. Compare and explain the properties of substances resulting from different types of bonding. AHL Predict the shape and bond angles for species with five and six negative charge centres using the VSEPR theory. Describe σ and π bonds. Explain hybridization in terms of the mixing of atomic orbitals to form new orbitals for bonding. Identify and explain the relationships between Lewis structures, molecular shapes and types of hybridization (sp, sp**2** and sp**3**). Describe the delocalization of π electrons and explain how this can account for the structures of some species.

Assessment

Worksheets/Assignments
Summative: Other Written Assessment
Worksheets to assess students' learning on a daily basis.

Quizzes and a unit Test.
Summative: Standardized Test

Quizzes on a regular basis and a unit test.

Labs
Summative: Lab Assignment
Students start with the first design lab.

Information Literacy & ICT	International Mindedness	TOK
Project based on ICT.	All combinations and permutations are possible with atomic bonding. Is this possible with people across borders of politics, race, religion, etc.	

Strategies / Activities / Differentiation	Resources
An easier level project for students with ICT difficulties.	Chemistry Course Companion Teacher assisted learning materials Independent research instuments Worksheets.

Unit Reflections

Unit: Energetics	
IB Expectations/ Assessment Criteria	
DP Group 4:Chemistry, DP - Age 16-18, Objectives It is the intention of all the Diploma Programme experimental science courses that students achieve the following objectives. ▪ 1. Demonstrate an understanding of: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology d. methods of presenting scientific information. ▪ 2. Apply and use: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology to communicate effectively d. appropriate methods to present scientific information. ▪ 3. Construct, analyse and evaluate: a. hypotheses, research questions and predictions b. scientific methods and techniques c. scientific explanations. ▪ 4. Demonstrate the personal skills of cooperation, perseverance and responsibility appropriate for effective scientific investigation and problem solving. ▪ 5. Demonstrate the manipulative skills necessary to carry out scientific investigations with precision and safety.	
Approach	**Significant concept(s) / Considerations**
Practice driven, since the topic is very mathematical.	Calculations of enthalpy change Calculate enthalpy change from enthalpy level diagrams. Calculate Bond enthalpy.
Guiding Questions	**Learner Profile**
Is heat change a universal phenomenon?	▪ Knowledgeable ▪ Communicators ▪ Principled ▪ Balanced
Central Idea / Content	**Learning Objectives**
5.1 Exothermic and endothermic reactions. 5.2 Calculations of enthalpy changes 5.3 Hess's Law	Define the terms exothermic reaction, endothermic reaction and standard enthalpy change of reaction (ΔH^o). State that combustion and neutralization are exothermic processes.

5.4 Bond enthalpy 15.1 Standard enthalpy changes of reaction 15.2 Born Haber cycle 15.3 Entropy 15.4 Spontaneity	Apply the relationship between temperature change, enthalpy change and the classification of a reaction as endothermic or exothermic. Deduce, from an enthalpy level diagram, the relative stabilities of reactants and products, and the sign of the enthalpy change for the reaction. Calculate the heat energy change when the temperature of a pure substance is changed. Design suitable experimental procedures for measuring the heat energy changes of reactions. Calculate the enthalpy change for a reaction using experimental data on temperature changes, quantities of reactants and mass of water. Evaluate the results of experiments to determine enthalpy changes. Determine the enthalpy change of a reaction that is the sum of two or three reactions with known enthalpy changes. Define the term *average bond enthalpy*. Explain, in terms of average bond enthalpies, why some reactions are exothermic and others are endothermic. AHL Define and apply the terms *standard state, standard enthalpy change of formation*(ΔH)fo and *standard enthalpy change of combustion* (ΔH)co. Determine the enthalpy change of a reaction using standard enthalpy changes of formation and combustion. Define and apply the terms *lattice enthalpy* and *electron affinity*. Explain how the relative sizes and the charges of ions affect the lattice enthalpies of different ionic compounds. Construct a Born–Haber cycle for group 1 and 2 oxides and chlorides, and use it to calculate an enthalpy change. Discuss the difference between theoretical and experimental lattice enthalpy values of ionic compounds in terms of their covalent

	character. Discuss the difference between theoretical and experimental lattice enthalpy values of ionic compounds in terms of their covalent character. State and explain the factors that increase the entropy in a system. Predict whether the entropy change (ΔS) for a given reaction or process is positive or negative. Calculate the standard entropy change for a reaction (ΔSo) using standard entropy values (So) . Predict whether a reaction or process will be spontaneous by using the sign of ΔGo. Calculate ΔGo for a reaction using the equation $\Delta Go = \Delta Ho - T\Delta So$ and by using values of the standard free energy change of formation, ΔGfo. Predict the effect of a change in temperature on the spontaneity of a reaction using standard entropy and enthalpy changes and the equation $\Delta Go = \Delta Ho - T\Delta So$.

Assessment

Worksheets/Assignments
Summative: Other Written Assessment
Worksheets to assess students' learning on a daily basis.

Quizzes and a unit test.
Summative: Standardized Test
Quizzes will be held on a regular basis and a unit Test will be held.

Lab
Summative: Lab Assignment
Lab focusing on DCP and ICT (virtual lab).

Information Literacy & ICT	International Mindedness	TOK
ICT Lab	Invention of alternative technologies for energy change to save the earth.	

Strategies / Activities / Differentiation	Resources
Extra help for students having learning difficulties.	Chemistry Course companion Teacher assisted learning materials Independent research instruments Worksheets

Unit Reflections

Unit: Kinetics

IB Expectations/ Assessment Criteria

DP Group 4:Chemistry, DP - Age 16-18, Objectives

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- 2. Apply and use: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology to communicate effectively d. appropriate methods to present scientific information.
- 3. Construct, analyse and evaluate: a. hypotheses, research questions and predictions b. scientific methods and techniques c. scientific explanations.
- 4. Demonstrate the personal skills of cooperation, perseverance and responsibility appropriate for effective scientific investigation and problem solving.
- 5. Demonstrate the manipulative skills necessary to carry out scientific investigations with precision and safety.

Approach	**Significant concept(s) / Considerations**
Based on previous knowledge. (Only the AHL portion will be done this semester. Core was done last semester.)	Students recall factors that increases the rate of reaction. The concept is developed.
Guiding Questions	**Learner Profile**
If the rate of reaction is calculated then prediction of the existance of a monument becomes very realistic (considering that only the conditions remain the same over a long period of time.	▪ Inquirers ▪ Knowledgeable ▪ Communicators ▪ Open-minded ▪ Reflective
Central Idea / Content	**Learning Objectives**
6.1 Rates of reaction 6.2 Collision theory 16.1 Rate Expression	Define the term *rate of reaction*. Describe suitable experimental procedures for measuring rates of reactions.

16.2 Reaction mechanism 16.3 Activation energy	Analyse data from rate experiments. Describe the kinetic theory in terms of the movement of particles whose average energy is proportional to temperature in kelvins. Define the term *activation energy*, *E*a. Describe the collision theory. Predict and explain, using the collision theory, the qualitative effects of particle size, temperature, concentration and pressure on the rate of a reaction. Sketch and explain qualitatively the Maxwell–Boltzmann energy distribution curve for a fixed amount of gas at different temperatures and its consequences for changes in reaction rate. Describe the effect of a catalyst on a chemical reaction. Sketch and explain Maxwell – Boltzmann curves for reactions with and without catalysts. AHL Distinguish between the terms *rate constant*, *overall order of reaction* and *order of reaction* with respect to a particular reactant. Deduce the rate expression for a reaction from experimental data. Solve problems involving the rate expression. Sketch, identify and analyse graphical representations for zero-, first- and second-order reactions. Explain that reactions can occur by more than one step and that the slowest step determines the rate of reaction (rate-determining step). Describe the relationship between reaction mechanism, order of reaction and rate-determining step. Describe qualitatively the relationship between the rate constant (*k*) and temperature (*T*). Determine activation energy (*E*a) values from the Arrhenius equation by a graphical method.

Assessment
Worksheets/Assignments **Summative: Other Written Assessment** Worksheets to assess students' learning on daily basis. **Quizzes and Test** **Summative: Standardized Test** Quizzes on a regular basis and a unit Test will be given. **Lab** **Summative: Lab Assignment** Work based mainly on DCP and ICT.

Information Literacy & ICT	**International Mindedness**	**TOK**
ICT Lab on rate of reaction.	How to protect monuments of international fame?	The empirical nature of the topic should be emphasized. Experimental results can support the theory but cannot prove it.

Strategies / Activities / Differentiation	**Resources**
Students with learning difficulties will have support lessons.	Chemistry Course Companion Teacher assisted learning materials Independent research work Worksheets

Unit Reflections
Students have done the core portion last semester and only the AHL portion will be done.

Unit: Chemical Equilibrium	
IB Expectations/ Assessment Criteria	
DP Group 4:Chemistry, DP - Age 16-18, Objectives It is the intention of all the Diploma Programme experimental science courses that students achieve the following objectives. ▪ 1. Demonstrate an understanding of: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology d. methods of presenting scientific information. ▪ 2. Apply and use: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology to communicate effectively d. appropriate methods to present scientific information. ▪ 3. Construct, analyse and evaluate: a. hypotheses, research questions and predictions b. scientific methods and techniques c. scientific explanations. ▪ 4. Demonstrate the personal skills of cooperation, perseverance and responsibility appropriate for effective scientific investigation and problem solving. ▪ 5. Demonstrate the manipulative skills necessary to carry out scientific investigations with precision and safety.	
Approach	Significant concept(s) / Considerations
Understanding equilibrium in Nature and then applying the same concept to chemical reactions.	Relating dynamic equilibrium from personal experience to learn chemical equilibrium.
Guiding Questions	Learner Profile
Our chemical industrial production is all about striking the right balance.	▪ Knowledgeable ▪ Communicators ▪ Balanced ▪ Reflective

Central Idea / Content	Learning Objectives
7.1 Dynamic equilibrium 7.2 The position of equilibrium	Outline the characteristics of chemical and physical systems in a state of equilibrium. Deduce the equilibrium constant expression (Kc) from the equation for a homogeneous reaction. Deduce the extent of a reaction from the magnitude of the equilibrium constant. Apply Le Chatelier's principle to predict the qualitative effects of changes of temperature, pressure and concentration on the position of equilibrium and on the value of the equilibrium constant. State and explain the effect of a catalyst on an equilibrium reaction. Apply the concepts of kinetics and equilibrium to industrial processes.

Assessment
Worksheets/Assignments Summative: Other Written Assessment Worksheets to assess students' learning on a daily basis. Quizzes and a unit Test Summative: Standardized Test Several quizzes and a unit test will be used to asses students' learning. Lab

Summative: Lab Assignment Group IV projects being done.		
Information Literacy & ICT	International Mindedness	TOK
ICT used by students to do Group IV project. Simulation of available models.	A case study of Fritz Haber. What should be the role of a scientist in our society?	

Strategies / Activities / Differentiation	Resources
More simulation activities to understand the reaching of the equilibrium.	Chemistry Course Companion Teacher assisted learning materials Independent research work Worksheets

Unit Reflections

Unit: **Acid-Base**

IB Expectations/ Assessment Criteria

DP Group 4:Chemistry, DP - Age 16-18, Aims

All the Diploma Programme experimental science courses should aim to:

- 1. provide opportunities for scientific study and creativity within a global context that will stimulate and challenge students
- 2. provide a body of knowledge, methods and techniques that characterize science and technology
- 3. enable students to apply and use a body of knowledge, methods and techniques that characterize science and technology
- 4. develop an ability to analyse, evaluate and synthesize scientific information
- 5. engender an awareness of the need for, and the value of, effective collaboration and communication during scientific activities
- 6. develop experimental and investigative scientific skills
- 7. develop and apply the students' information and communication technology skills in the study of science
- 8. raise awareness of the moral, ethical, social, economic and environmental implications of using science and technology
- 9. develop an appreciation of the possibilities and limitations associated with science and scientists
- 10. encourage an understanding of the relationships between scientific disciplines and the overarching nature of the scientific method.

Approach	**Significant concept(s) / Considerations**
As the topic is very close to the real life, a practical oriented approach and group discussion method is used to teach the chapter. Acid bases are most common topic among young children as it's a part of daily life. As the topic is very close to the real life, a practical oriented approach and group discussion method is used to teach the chapter. Acid bases are most common topic among young children as it's a part of daily life	The terms acid and bases are relative. The perspective makes a huge change in its definition and how it reacts to a new substance, in a given situation also varies with changing definitions.
Guiding Questions	**Learner Profile**
What can be called as acid or base. How they behave in various given environment, their threats and blessing	▪ Inquirers ▪ Knowledgeable ▪ Thinkers

	▪ Principled ▪ Reflective
Central Idea / Content	**Learning Objectives**
8.1 Theories of acids and bases 8.2 Properties of acids and bases 8.3 Strong and weak acids and bases 8.4 The pH scale 18.1 Calculations involving acids and bases 18.2 Buffer solutions 18.3 Salt hydrolysis 18.4 Acid–base titrations 18.5 Indicators	Every day in life we face acids and base, in different medium and different context, some are helpful some are not, but a knowledge of each, acid and base and how they work, and how to work with them makes lives easier and comforting. More over nature is neither very acidic or basic, it balances between the both, and it's a vital lesson for natural way of living.

Assessment

Information Literacy & ICT	**International Mindedness**	**TOK**
1. Virtual simulation of buffer to understand the buffer action is used Virtual simulations of various types of acids and bases using various indictors are done with data-logging software and graphs are plotted and role of indicator, buffer region analyzed	There are various ways acidity of basicity of a solution is measure in various parts of the world, but pH scale has made the understanding of acidity easier to non-chemists	The distinction between artificial and natural scales could be discussed in the context of pH scale

Strategies / Activities / Differentiation	**Resources**
This topic is taught with lots of hands on activity and virtual activity. Every lesson is backed up by on the class work which enforced learning. The students who has problem in understanding the basic chemistry behind it were given easier problems for	1. IB chemistry-Geoff Neuss 2. Chemistry text book-Catrin Brown 3. IB revision guide-Geoff Neuss 4. PowerPoint presentations as teaching aid (on core and

confidence building and then moved to normal main stream set of works	advanced concepts) 5. Web resources (teacher tube etc) 6. IB-Question bank on Acid base equilibrium 7. Worksheet on a. Conjugate acid base pair b. Lewis acid base identification c. Acid base properties d. Acid base reactions
Unit Reflections	

Unit: Oxidation and Reduction

IB Expectations/ Assessment Criteria

Approach	**Significant concept(s) / Considerations**
Interactive	oxidation is loss of electron and reduction is gain of electron or in othe oxidation number but in reduction it decreases.
Guiding Questions	**Learner Profile**
Can oxidation reduction happen together or separately, if so how can it be detected Can oxidation and reduction happen together, if yes, what are the indicators of that. Where can I apply my knowleged of oxidation and reduction in regular life.	▪ Inquirers ▪ Knowledgeable ▪ Thinkers ▪ Risk-takers ▪ Reflective
Central Idea / Content	**Learning Objectives**
9.1 Introduction to oxidation and reduction 9.2 Redox equations 9.3 Reactivity 9.4 Voltaic cells 9.5 Electrolytic cells 19.1 Standard electrode potentials 19.2 Electrolysis	Students learnt oxidation and reduction in terms of electron loss or gai oxidation number. Practical application of oxidation and reduction in s purification or extraction of metals is explained with reference to react feasibility of a given reaction.

<u>Assessment</u>

Other Written Assessment

Errors and uncertainties **Other Written Assessment** Worksheet **Other Written Assessment** Study of Redox reactions **Other Written Assessment** DCP **Other Written Assessment** Assignment **Other Written Assessment** The Oxidation States of Vanadium, Manganese DCP,CE **Examination** Test **Other Written Assessment** Electrochemical cells – 1& 2 D

Information Literacy & ICT	**International Mindedness**	**TOK**
1. Virtual simulation of the electrolysis of copper (II) sulphate is discussed.	Oxidation number is an universal term, which replaces the older definitions like valance, etc.	Are oxidatior Chemistry ha

		resulted in ol been gained a

Strategies / Activities / Differentiation	Resources
This topic is taught with lots of hands on activity and virtual activity. Every lesson is backed up by on the class work which enforced learning. The students who has problem in understanding the basic chemistry behind it were given easier problems for confidence building and then moved to normal main stream set of works	1. IB chemistry-Geoff Neuss 2. Chemistry text book-Catrin Brown 3. PowerPoint presentations as teaching aid (on core and advanced 4. Web resources (teacher tube etc) 5. Worksheet on a. Ionic equations b. Oxidation number c. Half equations d. Oxidizing and reducing agents Reactivity series

Unit Reflections

<< Previous Year

Unit: Organic Chemistry	
IB Expectations/ Assessment Criteria	
Approach	**Significant concept(s) / Considerations**
interactive	Which general group a particular compound belongs and what is the chemical property of the group?
Guiding Questions	**Learner Profile**
Organic chemicals behave similarly inside its homologous series. So it's important to understand which particular homologous series a compound falls under and how does it react to a particular group of reagents to form product?	▪ Inquirers ▪ Knowledgeable ▪ Thinkers ▪ Communicators ▪ Reflective
Central Idea / Content	**Learning Objectives**
10.1 Introduction 10.2 Alkanes 10.3 Alkenes 10.4 Alcohols 10.5 Halogenoalkanes 10.6 Reaction pathways 20.1 Introduction 1 20.2 Nucleophilic substitution reactions 20.3 Elimination reactions 20.4 Condensation reactions 20.5 Reaction pathways 20.6 Stereoisomerism	This is an introductory course to organic chemistry. Students are expected to understand the whole range of organic chemicals is grouped into several categories called homologous series and all the members of the group behave similarly chemically. So it's more general reaction trends which apply to the group. In this course student will learn how the organic chemicals are named depending on the branching of carbon chain.

Assessment
Other Written Assessment Electrochemical cells 1 & 2 **Examination** Test **Other Written Assessment** Assignment **Other Written Assessment** DCP **Other Written Assessment** Chemical properties of hydrocarbons DCP **Examination** Test **Other Written Assessment** Reactions of aldehydes, ketones DCP **Other Written Assessment** Nucleophilic substitution reactions of halogenoalkanes DCP **Examination** Assignment and Test

Information Literacy & ICT	International Mindedness	TOK
Power point slide for anchoring thru the subtopics and concepts are used for better and clear understanding.	Why the IUPAC naming for organic compounds were introduced though most of the compounds are known for centuries.	1. The use of the different formulas illustrates the value of different models with different depths of detail. This could be discussed as an example of the

Flash animations are used for clear understanding of some reactions. During this course, student will do several virtual experiments and simulations to understand the electrophilic and nuclophilic reactions and substitution or elimination or addition subtype.		2. Use of the language of chemistry as a tool to classify and distinguish between different structures. The existence of optical isomers provided indirect evidence of a tetrahedrally bonded carbon atom. This is an example of the power of reasoning in allowing us access to the molecular scale. Do we know or believe those carbon atoms are tetrahedrally coordinated? The use of conventions in representing three- dimensional molecules in two dimensions could also be discussed.

Strategies / Activities / Differentiation	**Resources**
Students will be introduced with the initial concepts of the particular subtopic and they face an online test which poses some of the problems on the particular concept under consideration. Thereafter the more complicated concepts will be introduced in the next half of the class. and molecular modelling tools are used to illustate the 3D concepts. Students were asked to read thru a particular part of text before next class.	1. IB chemistry-Geoff Neuss 2. Chemistry text book-Catrin Brown 3. PowerPoint presentations as teaching aid (on core and advanced concepts) 4. Web resources (teacher tube etc) 5. Worksheet on a. Nomenclature b. Isomerism c. Reactions of alkanes d. Reactions of haloalkane e. Reactions of alkene Reactions of alcohols Molecular modelling tools

Unit Reflections

B Expectations/ Assessment Criteria

DP Group 4:Chemistry, DP - Age 16-18, Syllabus - Option A

OPTIONS SL and HL

Option A: Modern analytical chemistry (15/22 hours)

A1 Analytical techniques

- A.1.1 State the reasons for using analytical techniques.
- A.1.2 State that the structure of a compound can be determined by using information from a variety of analytical techniques singularly or in combination.

A2 Principles of spectroscopy

- A.2.1 Describe the electromagnetic spectrum.
- A.2.2 Distinguish between absorption and emission spectra and how each is produced.
- A.2.3 Describe the atomic and molecular processes in which absorption of energy takes place.

A3 Infrared (IR) spectroscopy

- A.3.1 Describe the operating principles of a double-beam IR spectrometer.
- A.3.2 Describe how information from an IR spectrum can be used to identify bonds.
- A.3.3 Explain what occurs at a molecular level during the absorption of IR radiation by molecules.
- A.3.4 Analyse IR spectra of organic compounds.

A4 Mass spectrometry

- A.4.1 Determine the molecular mass of a compound from the molecular ion peak.
- A.4.2 Analyse fragmentation patterns in a mass spectrum to find the structure of a compound.

A5 Nuclear magnetic resonance (NMR) spectroscopy

- A.5.1 Deduce the structure of a compound given information from its ^{1}H NMR spectrum.
- A.5.2 Outline how NMR is used in body scanners.

A6 Atomic absorption (AA) spectroscopy

- A.6.1 State the uses of AA spectroscopy.
- A.6.2 Describe the principles of atomic absorption.
- A.6.3 Describe the use of each of the following components of the AA spectrophotometer: fuel, atomizer, monochromatic light source, monochromatic detector and read-out.
- A.6.4 Determine the concentration of a solution from a calibration curve.

A7 Chromatography

- A.7.1 State the reasons for using chromatography.
- A.7.2 Explain that all chromatographic techniques involve adsorption on a stationary phase and partition between a stationary

phase and a mobile phase.

- A.7.3 Outline the use of paper chromatography, thin-layer chromatography (TLC) and column chromatography.

A8 Visible and ultraviolet (UV-Vis) spectroscopy (HL)

- A.8.1 Describe the effect of different ligands on the splitting of the d orbitals in transition metal complexes.
- A.8.2 Describe the factors that affect the colour of transition metal complexes.
- A.8.3 State that organic molecules containing a double bond absorb UV radiation.
- A.8.4 Describe the effect of the conjugation of double bonds in organic molecules on the wavelength of the absorbed light.
- A.8.5 Predict whether or not a particular molecule will absorb UV or visible radiation.
- A.8.6 Determine the concentration of a solution from a calibration curve using the Beer–Lambert law.

A9 Nuclear magnetic resonance (NMR) spectroscopy (HL)

- A.9.1 Explain the use of tetramethylsilane (TMS) as the reference standard.
- A.9.2 Analyse ^{1}H NMR spectra.

A10 Chromatography (HL)

- A.10.1 Describe the techniques of gas–liquid chromatography (GLC) and high-performance liquid chromatography (HPLC).
- A.10.2 Deduce which chromatographic technique is most appropriate for separating the components in a particular mixture.

Approach	**Significant concept(s) / Considerations**
Option-A: Analytical Chemistry . interactive classroom based, lecture based teaching	Determination of the exact structure of a particular compound is necessary for various drug design and vaccine invention.
Guiding Questions	**Learner Profile**
How to determine the structure of a given compound found in nature for industrial synthesis of it or chemical property analysis by the researchers.	▪ Inquirers ▪ Thinkers ▪ Open-minded ▪ Risk-takers ▪ Reflective
Central Idea / Content	**Learning Objectives**
· A1 Analytical techniques · A2 Principles of spectroscopy · A3 Infrared (IR) spectroscopy	Analysis of chemical compounds is essential in terms of new drug design and testing of the old drugs and its effect on human health. But the modern processes has changed the we used to analyze or

· A4 Mass spectrometry · A5 Nuclear magnetic resonance (NMR) spectroscopy · A6 Atomic absorption (AA) spectroscopy · A7 Chromatography **Advanced topics** · A8 Visible and ultraviolet (UV-Vis) spectroscopy · A9 Nuclear magnetic resonance (NMR) spectroscopy · A10 Chromatography	determine the structure of the compound previously. Basically during this course we will be concentrating on NMR, UV-visible and Mass spectra, all or any three and try to analyze them to determine the structure 1. State the reasons for using analytical techniques. State that the structure of a compound can be determined by using information from a variety of analytical techniques singularly or in combination. Describe the electromagnetic spectrum. Distinguish between absorption and emission spectra and how each is produced. Describe the atomic and molecular processes in which absorption of energy takes place. 2. Describe the operating principles of a double-beam IR spectrometer. Describe how information from an IR spectrum can be used to identify bonds. Explain what occurs at a molecular level during the absorption of IR radiation by molecules. Analyse IR spectra of organic compounds. 3. Determine the molecular mass of a compound from the molecular ion peak. Analyse fragmentation patterns in a mass spectrum to find the structure of a compound. 4. Deduce the structure of a compound given information from its 1H NMR spectrum. Outline how NMR is used in body scanners. Explain the use of tetra methyl silane (TMS) as the reference standard. Analyse 1H NMR spectra. 5. State the uses of AA spectroscopy. Describe the principles of atomic absorption. Describe the use of each of the following components of the AA spectrophotometer: fuel, atomizer, monochromatic light source, monochromatic detector and readout. Determine the concentration of a solution from a calibration curve. 6. State the reasons for using chromatography. Explain that all chromatographic techniques involve adsorption on a stationary phase and partition between a stationary phase and a mobile phase. Outline the use of paper chromatography, thin-layer chromatography (TLC) and column chromatography. Describe the

	techniques of gas–liquid chromatography (GLC) and high performance liquid chromatography (HPLC). Deduce which chromatographic technique is most appropriate for separating the components in a particular mixture. 7. Describe the effect of different ligands on the splitting of the d orbitals in transition metal complexes. Describe the factors that affect the colour of transition metal complexes. State that organic molecules containing a double bond absorb UV radiation. Describe the effect of the conjugation of double bonds in organic molecules on the wavelength of the absorbed light. Predict whether or not a particular molecule will absorb UV or visible radiation. Determine the concentration of a solution from a calibration curve using the Beer–Lambert law.

Assessment

Information Literacy & ICT	**International Mindedness**	**TOK**
As analytical chemistry is mostly data dependent, simulations available online on mass and NMR generation will be used for showing and predicting structure	Is the present international patent law is supportive towards the low cost medicine and better human health?	The electromagnetic spectrum is a carrier of information. The nature of the information is limited by its wavelength.

Strategies / Activities / Differentiation	**Resources**
Stategies: Students will be provided with the information and basic analytical technique using NMR, mass and UV-IR spectra. We will take a few known cases to understand information Given by these techniques and then try to analyze unknown information to determine the structure.	· IB chemistry-Geoff Neuss · Chemistry text book-Catrin Brown · IB revision guide-Geoff Neuss · PowerPoint presentations as teaching aid (on core and advanced concepts) · Web resources (teacher tube etc) · IB-Question bank on Acid base equilibrium

Activities: Activities includes Java applet for NMR spectra interactive Students with ESL background will be provided with a vocabulary and definition list to understand the key terms clearly. differentiation: "Weaker students will be helped individually" a simpler version of worksheet and simple version of instruction is given to the students with difficulties.	· Worksheet on o mass spectra o UV and visible spectra o NMR spectra o Chromatography
Unit Reflections	

Unit: Option 2

IB Expectations/ Assessment Criteria

DP Group 4:Chemistry, DP - Age 16-18, Syllabus - Option C

Option C: Chemistry in industry and technology (15/22 hours)

C1 Iron, steel and aluminium

- C.1.1 State the main sources of iron.
- C.1.2 Describe and explain the reactions that occur in the blast furnace.
- C.1.3 Describe and explain the conversion of iron into steel using the basic oxygen converter.
- C.1.4 Describe alloys as a homogeneous mixture of metals or a mixture of a metal and non-metal.
- C.1.5 Explain how alloying can modify the properties of metals.
- C.1.6 Describe the effects of heat treatment of steel.
- C.1.7 Describe the properties and uses of iron and steel.
- C.1.8 Describe and explain the production of aluminium by electrolysis of alumina in molten cryolite.
- C1.9 Describe the main properties and uses of aluminium and its alloys.
- C.1.10 Discuss the environmental impact of iron and aluminium production.

C2 The oil industry

- C.2.1 Compare the use of oil as an energy source and as a chemical feedstock
- C.2.2 Compare catalytic cracking, thermal cracking and steam cracking.

C3 Addition polymers

- C.3.1 Describe and explain how the properties of polymers depend on their structural features.
- C.3.2 Describe the ways of modifying the properties of addition polymers.
- C.3.3 Discuss the advantages and disadvantages of polymer use.

C4 Catalysts

- C.4.1 Compare the modes of action of homogeneous and heterogeneous catalysts.
- C.4.2 Outline the advantages and disadvantages of homogeneous and heterogeneous catalysts.

- C.4.3 Discuss the factors in choosing a catalyst for a process.

C5 Fuel cells and rechargeable batteries

- C.5.1 Describe how a hydrogen–oxygen fuel cell works.
- C.5.2 Describe the workings of rechargeable batteries.
- C.5.3 Discuss the similarities and differences between fuel cells and rechargeable batteries.

C6 Liquid crystals

- C.6.1 Describe the meaning of the term liquid crystals.
- C.6.2 Distinguish between thermotropic and lyotropic liquid crystals.
- C.6.3 Describe the liquid-crystal state in terms of the arrangement of the molecules and explain thermotropic behaviour.
- C.6.4 Outline the principles of the liquid-crystal display device.
- C.6.5 Discuss the properties needed for a substance to be used in liquid-crystal displays.

C7 Nanotechnology

- C.7.1 Define the term nanotechnology.
- C.7.2 Distinguish between physical and chemical techniques in manipulating atoms to form molecules.
- C.7.3 Describe the structure and properties of carbon nanotubes.
- C.7.4 Discuss some of the implications of nanotechnology.

C8 Condensation polymers (HL)

- C.8.1 Distinguish between addition and condensation polymers in terms of their structures.
- C.8.2 Describe how condensation polymers are formed from their monomers.
- C.8.3 Describe and explain how the properties of polymers depend on their structural features.
- C.8.4 Describe ways of modifying the properties of polymers.
- C.8.5 Discuss the advantages and disadvantages of polymer use.

C9 Mechanisms in the organic chemicals industry (HL)

- C.9.1 Describe the free-radical mechanism involved in the manufacture of low-density polyethene.
- C.9.2 Outline the use of Ziegler–Natta catalysts in the manufacture of high-density polyethene.

C10 Silicon and photovoltaic cells (HL)

- C.10.1 Describe the doping of silicon to produce p-type and n-type semiconductors.
- C.10.2 Describe how sunlight interacts with semiconductors.

C11 Liquid crystals (HL)

- C.11.1 Identify molecules that are likely to show liquid-crystal properties, and explain their liquid-crystal behaviour on a molecular level.
- C.11.2 Describe and explain in molecular terms the workings of a twisted nematic liquid crystal.
- C.11.3 Describe the liquid-crystal properties of Kevlar, and explain its strength and its solubility in concentrated sulfuric acid.

C12 The chlor-alkali industry (HL)

- C.12.1 Discuss the production of chlorine and sodium hydroxide by the electrolysis of sodium chloride.
- C.12.2 Outline some important uses of the products of this process.
- C.12.3 Discuss the environmental impact of the processes used for the electrolysis of sodium chloride.

▪ Approach	▪ Significant concept(s) / Considerations
▪ in this course, a brief introduction to various chemical processes and their economy and other aspect (related to environment and human health) are discussed thru a chemical looking glass.	▪ industry and economy are interrelated. understanding of the chemistry behind most industrial process, which may otherwise pose problems and create serious concern ▪ in the field of environment and biodiversity.
▪ Guiding Questions	▪ Learner Profile
▪ Is the industrial growth and economic development more important than human health and biodiversity ? and if so how to balance between the both ends?	▪ ▪ Thinkers ▪ Principled ▪ Caring ▪ Risk-takers ▪ Reflective ▪
▪ Central Idea / Content	▪ Learning Objectives
▪ C1 Iron, steel and aluminium 3.5 ▪ C2 The oil industry 2 ▪ C3 Addition polymers 2 ▪ C4 Catalysts 1.5 ▪ C5 Fuel cells and rechargeable batteries 2 ▪ C6 Liquid crystals 2 ▪ C7 Nanotechnology 2	▪ ▪ ▪ ▪ ▪ ▪ At this age of industrial development and booming economy, its becomes essential for every chemistry student

▪ ▪ **Advanced topics** ▪ C8 Condensation polymers 1 ▪ C9 Mechanisms in the organic chemicals industry 1 ▪ C10 Silicon and photovoltaic cells 1 ▪ C11 Liquid crystals 2 ▪ C12 The chlor-alkali industry 2 ▪	the various chemical processes which are the backbone of the chemical industries. It has its direct relationship in terms of economy, human health and safety and environmental issues. During this course we will be analyzing various important chemical process in the industry, what goes on in terms of chemical transformation and various factors related to human health and economic profitability. ▪ 1. State the main sources of iron. Describe and explain the reactions that occur in the blast furnace. Describe and explain the conversion of iron into steel using the basic oxygen converter. Describe alloys as a homogeneous mixture of metals or a mixture of a metal and non-metal. Explain how alloying can modify the properties of metals. Describe the effects of heat treatment of steel. Describe the properties and uses of iron and steel. Describe and explain the production of aluminium by electrolysis of alumina in molten cryolite. Describe the main properties and uses of aluminium and its alloys. Discuss the environmental impact of iron and aluminium production. ▪ 2. Compare the use of oil as an energy source and as a chemical feedstock Compare catalytic cracking, thermal cracking and steam cracking. ▪ ▪ 3. Addition polymers Describe and explain how the properties of polymers depend on their structural features. Describe the ways of modifying the properties of addition polymers. Discuss the advantages and disadvantages of polymer use. ▪ ▪ 4. Catalysts Compare the modes of action of homogeneous and heterogeneous catalysts. Outline the advantages and disadvantages of homogeneous and

	heterogeneous catalysts. Discuss the factors in choosing a catalyst for a process. ▪ ▪ 5. Fuel cells and rechargeable batteries Describe how a hydrogen–oxygen fuel cell works. Describe the workings of rechargeable batteries. Discuss the similarities and differences between fuel cells and rechargeable batteries. ▪ ▪ 6. Liquid crystals describe the meaning of the term liquid crystals. Distinguish between thermotropic and lyotropic liquid crystals. Describe the liquid-crystal state in terms of the arrangement of the molecules and explain thermotropic behaviour. Outline the principles of the liquid-crystal display device. Discuss the properties needed for a substance to be used in liquid-crystal displays. ▪ ▪ 7. Nanotechnology Define the term nanotechnology. Distinguish between physical and chemical techniques in manipulating atoms to form molecules. Describe the structure and properties of carbon nanotubes. Discuss some of the implications of nanotechnology. ▪ ▪ 8. Condensation polymers (HL) Distinguish between addition and condensation polymers in terms of their structures. Describe how condensation polymers are formed from their monomers. Describe and explain how the properties of polymers depend on their structural features. Describe ways of modifying the properties of polymers. Discuss the advantages and disadvantages of polymer use. ▪ ▪ 9. Mechanisms in the organic chemicals industry (HL)

	Describe the free-radical mechanism involved in the manufacture of low-density polyethene. Outline the use of Ziegler–Natta catalysts in the manufacture of high-density polyethene. ▪ ▪ 10. Silicon and photovoltaic cells (HL) Describe the doping of silicon to produce p-type and n-type semiconductors. Describe how sunlight interacts with semiconductors. ▪ ▪ 11. Liquid crystals (HL) Identify molecules that are likely to show liquid-crystal properties, and explain their liquid-crystal behaviour on a molecular level. ▪ 12. Describe and explain in molecular terms the workings of a twisted nematic liquid crystal. Describe the liquid-crystal properties of Kevlar, and explain its strength and its solubility in concentrated sulfuric acid. The chlor-alkali industry (HL) Discuss the production of chlorine and sodium hydroxide by the electrolysis of sodium chloride. Outline some important uses of the products of this process. Discuss the environmental impact of the processes used for the electrolysis of sodium chloride ▪

- Assessment

- Other Written Assessment
- Acid rain simulation
- Other Written Assessment
- D, DCP, CE
- Other Written Assessment
- Worksheet
- Other Written Assessment
- Determination of dissolved oxygen DCP, CE
- Other Written Assessment

- Assignment
- Other Written Assessment
- Research assignment
- Examination
- Test
- Other Written Assessment
- Soil analysis DCP
- Other Written Assessment
- Worksheet

Information Literacy & ICT	International Mindedness	TOK
As analytical chemistry is mostly data dependent, simulations available online on mass and NMR generation will be used for showing and predicting structure	Is the present international patent law is supportive towards the low cost medicine and better human health?	· Who should decide whether particular directions in research are pursued? Who should determine priorities in the funding of research? · The use of the scanning tunneling microscope has allowed us to “see” individual atoms. Does technology blur the distinction between simulation and reality?

Strategies / Activities / Differentiation	Resources
Strategies: Simulations and videos of industrial processes will be provided to the students to make the process clearer instead of diagram or lecturing. Students will be asked verbal questions and will be asked some chosen specific IB questions to answer while teaching that particular topic. **Activities**: Short quiz and test will be conducted at every class to understand the students understanding of present concepts. Students were asked to discuss in a group to analyse some information and rationalize.	· IB chemistry-Geoff Neuss · Chemistry text book-Catrin Brown · IB revision guide-Geoff Neuss · PowerPoint presentations as teaching aid (on core and advanced concepts) · Web resources (teacher tube etc) · IB-Question bank on Acid base equilibrium · Worksheet on industrial techniques liquid crystals and nanotechnology

differentiation: "Weaker students will be helped individually" a simpler version of worksheet and simple version of instruction is given to the students with difficulties.	o

Unit Reflections

Stage 1: Integrate significant concept, area of interaction and unit question

Area of interaction focus
Which area of interaction will be our focus? Why have we chosen this?

- Health and Social Education
- Environments

The above AOIs were chosen so that at the endof the unit, students are able to answer thefollowing questions, by themselves and analysesome thoughts further.Where do we live (is the air around us is acidic,basic, or neutral)?What resources do we have or need(regularuse items, including toiletries)?How does it compare to other places aroundthe world (acid in the air and how much,Pollution)?What are my responsibilities to my communityand my world?Do I need to change the way I think or act tomake my environment a more positive place(use of proper chemical and its disposal)?

Significant concept(s)
What are the big ideas? What do we want our students to retain for years into the future?

though various substance may remain in acidic or basic form, nature prefers neutrality. So most natural things are neutral or close to neutral

MYP Unit Question

What is natural?
(what is natural characteristics of most substances around us and how to determine that)

Assessment

What task(s) will allow students the opportunity to respond to the unit questions?
What will constitute acceptable evidence of understanding? How will students show what they have understood?

titration-simulation
Formative: Other Visual Assessment
Formative: Other Visual Assessment
Students in this assessment has done two titration of weak and strong acid with base using three different indicator (manually and using pH meter) to understand the process of neutralisation and pH change in the

classroom

MYP Objectives

Which specific MYP objectives will be addressed during this unit?

MYP: Sciences (For use from Sept. 2010/Jan. 2011), MYP Year 5, B Communication in science

At the end of the course, students should be able to:

- use scientific language correctly
- use appropriate communication modes such as verbal (oral, written), visual (graphic, symbolic) and communication formats (laboratory reports, essays, presentations) to effectively communicate theories, ideas and findings in science
- acknowledge the work of others and the sources of information used by appropriately documenting them using a recognized referencing system.

IB Expectations/ Assessment Criteria

Which MYP assessment criteria will be used?

MYP: Sciences (For use from Sept. 2005/Jan. 2006), MYP Year 5, Assessment Criteria

Criterion B: communication in science

- The student communicates scientific information effectively using scientific language correctly.
- The student presents all the information appropriately using symbolic and/or visual representation accurately according to the task.
- The student acknowledges sources of information appropriately.

Criterion C: knowledge and understanding of science

- The student explains scientific ideas and concepts and applies scientific understanding to solve problems in familiar and unfamiliar situations.
- The student analyses and evaluates scientific information by making scientifically supported judgments about the information, the validity of the ideas or the quality of the work.

Criterion E: processing data

- The student organizes and transforms data into numerical and diagrammatic forms and presents it logically and clearly, using appropriate communication modes.
- The student explains trends, patterns or relationships in the data, comments on the reliability of the data, draws a clear

conclusion based on the correct interpretation of the data, and explains it using scientific reasoning.

Criterion F: attitudes in science

- The student works largely independently; uses equipment with precision and skill; pays close attention to safety and deals responsibly with the living and non-living environment.
- The student consistently works effectively as part of a team, collaborating with others and respecting their views.

Stage 2: Backward planning: from assessment to the learning activities through inquiry.

Content

What knowledge and/or skills (from the course overview) are going to be used to enable the student to respond to the guiding question?
What (if any) state, provincial, district, or local standards/skills are to be addressed?
How can they be unpacked to develop the significant concept(s) for stage 1?

what is acid and its properties
what are bases, and its properties,
chemical properties of acids and bases
how to measure acidity and basicity
indicator and colour of indicator,
students should be able to write simple acid base neutralisation reaction
salts and how they are formed, naming the acid and base from salt

given properties, identify substances as acids orbases
write simple neutralization reactions when given the reactants
calculate the concentration or volume of a solution, using titration data
identify solutions as acid, base, or neutral based upon the pH
interpret changes in acid-base indicator color

Approaches to Learning

How will this unit contribute to the overall development of subject-specific and general approaches to learning skills?

- Reflection students by doing simulation will understand the pH change in titration is very sharp as itcloser to the

- Thinking neutralisation.they should apply the acid base neutralisation in general life situation like, bee-stigs andother natural phenomenon.

Learning Experiences	**Strategies / Activities / Differentiation**
How will students know what is expected of them? Will they see examples, rubrics, templates? How will students acquire the knowledge and practise the skills required? How will they practise applying these? Do the students have enough prior knowledge? How will we know?	How will we use formative assessment to give students feedback during the unit? What different teaching methodologies will we employ? How are we differentiating teaching and learning for all? How have we made provision for those learning in a language other than their mother tongue? How have we considered those with special educational needs?
students prior knowledge was tested using "prepost-sheet" students were asked to work on their intial worksheets, which talks about natural substances, and its acidity and pH. students are expected to follow the Criteria E and F rubrics which is provided to them for their reference in the laboratory. student practice their skills in the class, by completing the class assignments. remaining part of the assignment is sent to them in the form of mail for their further support. in this chapter, students has prior knowledge, except misconception about acids and bases. they learnt salt as new topic.	no differentiation is made, during this unit. students mostly worked in the groups and simulation was handled by few student representatives.

Resources

What resources are available to us?
How will our classroom environment, local environment and/or the community be used to facilitate students' experiences during the unit?

webresources like online titration simulation
Acid base neutralisation Video from you-tube is used to show them neutralisation reaction
powerpoint worksheets for working out in and after the class

powerpoint teaching guide for classroom lecture support

Ongoing reflections and evaluation

Unit Reflections

In keeping an ongoing record, consider the following questions. There are further stimulus questions in the unit planning section of *MYP: From principles into practice.*

Students and teachers

What did we find compelling? Was our disciplinary knowledge/skills challenged in any way?
What inquiries arose during the learning? What, if any, extension activities arose?
How did we reflect - both on the unit and on our own learning?
Which attributes of the learner profile were encouraged through this unit? What opportunities were there for student-initiated action?

Possible connections

How successful was the collaboration with other teachers within my subject group and from other subject groups?
What interdisciplinary understandings were or could be forged through collaboration with other subjects?

Assessment

Were students able to demonstrate their learning?
How did the assessment tasks allow students to demonstrate the learning objectives identified for this unit? How did I make sure students were invited to achieve at all levels of the criteria descriptors?
Are we prepared for the next stage?

Data collection

How did we decide on the data to collect? Was it useful?

Stage 1: Integrate significant concept, area of interaction and unit question

Area of interaction focus
Which area of interaction will be our focus? Why have we chosen this?

- Human Ingenuity

At the end of the course, students can address the following issues:How do I know? How does an atom look like? How do I communicate that all the particles in atoms do not stay in the same place?What tools can I use to understand the electronic distribution of various elements? Why and how do we create the model of an atom, if none has seen it? What are the consequences if you have perceived it wrong? How do I know that the atom I am visualising,looks exactly the same?

Significant concept(s)
What are the big ideas? What do we want our students to retain for years into the future?

The model of an atom is entirely a mathematical perception.

MYP Unit Question

What is the structure of an atom?

Assessment

What task(s) will allow students the opportunity to respond to the unit questions?
What will constitute acceptable evidence of understanding? How will students show what they have understood?

Worksheet.
Formative: Written Report
Students will be given a worksheet on Friday 15.07.2011 to assess their understanding of the present concept of an atom.

MYP Objectives

Which specific MYP objectives will be addressed during this unit?

MYP: Sciences (For use from Sept. 2010/Jan. 2011), MYP Year 5, A One world
At the end of the course, students should be able to:

- explain the ways in which science is applied and used to address specific problems or issues
- discuss the effectiveness of science and its application in solving problems or issues
- discuss and evaluate the moral, ethical, social, economic, political, cultural and environmental implications of the use of science and its application in solving specific problems or issues.

MYP: Sciences (For use from Sept. 2010/Jan. 2011), MYP Year 5, B Communication in science

At the end of the course, students should be able to:

- use scientific language correctly
- use appropriate communication modes such as verbal (oral, written), visual (graphic, symbolic) and communication formats (laboratory reports, essays, presentations) to effectively communicate theories, ideas and findings in science
- acknowledge the work of others and the sources of information used by appropriately documenting them using a recognized referencing system.

MYP: Sciences (For use from Sept. 2010/Jan. 2011), MYP Year 5, C Knowledge & understanding of science

At the end of the course, students should be able to:

- recall scientific knowledge and use scientific understanding to construct scientific explanations
- apply scientific knowledge and understanding to solve problems set in familiar and unfamiliar situations
- critically analyse and evaluate information to make judgments supported by scientific understanding.

IB Expectations/ Assessment Criteria

Which MYP assessment criteria will be used?

MYP: Sciences (For use from Sept. 2005/Jan. 2006), MYP Year 5, Assessment Criteria

Criterion A: one world

- The student explains how science is applied to addressing a specific local or global issue.
- The student explains some of the benefits and limitations of science in solving the issue.
- The student discusses how science and its applications interact with some of the following factors: social, economic, political, environmental, cultural and ethical.

Criterion B: communication in science

- The student communicates scientific information effectively using scientific language correctly.
- The student presents all the information appropriately using symbolic and/or visual representation accurately according to the task.
- The student acknowledges sources of information appropriately.

Criterion C: knowledge and understanding of science

- The student explains scientific ideas and concepts and applies scientific understanding to solve problems in familiar and unfamiliar situations.

- The student analyses and evaluates scientific information by making scientifically supported judgments about the information, the validity of the ideas or the quality of the work.

Criterion D: scientific inquiry

- The student defines the purpose of the investigation, formulates a testable hypothesis and explains the hypothesis using scientific reasoning.
- The student identifies the relevant variables and explains how to manipulate them.
- The student evaluates the method commenting on its reliability and/or validity.
- The student suggests improvements to the method and makes suggestions for further inquiry when relevant.

Stage 2: Backward planning: from assessment to the learning activities through inquiry.

Content

What knowledge and/or skills (from the course overview) are going to be used to enable the student to respond to the guiding question?
What (if any) state, provincial, district, or local standards/skills are to be addressed?
How can they be unpacked to develop the significant concept(s) for stage 1?

The students will know the atomic timeline.
The students will know the Atomic Number and Mass Number.
The students will know what are Isotopes.
The students will know about Atomic Orbitals.
The students will know about the electronic configurations.

The students will give the historical development of the atomic concept.
The students will define the Atomic and Mass Number.
The students will give examples of Isotopes.
The students will give the orbitals in the sublevels.
The students will write the electronic configuration of atoms.

Approaches to Learning

How will this unit contribute to the overall development of subject-specific and general approaches to learning skills?

- Communication The students will communicate,reflect and think about the subject so that learning skills will develop.

- Reflection
- Thinking

Learning Experiences	Strategies / Activities / Differentiation
How will students know what is expected of them? Will they see examples, rubrics, templates? How will students acquire the knowledge and practise the skills required? How will they practise applying these? Do the students have enough prior knowledge? How will we know?	How will we use formative assessment to give students feedback during the unit? What different teaching methodologies will we employ? How are we differentiating teaching and learning for all? How have we made provision for those learning in a language other than their mother tongue? How have we considered those with special educational needs?
Questioning, demonstrating, explaining and quizzing.	Basics questions will be asked to gauge the prior knowledge of students on structure of atom. Students will be grouped in fours and asked to answer a few questions related to the topic. Definitions will be given and explained. Activity Students will come to the board and match the words with the definition which will be placed on two columns randomly. Teacher will teach the lesson and encourage note taking.Students will be given opportunities to clarify doubts.

Resources

What resources are available to us?
How will our classroom environment, local environment and/or the community be used to facilitate students' experiences during the unit?

Ongoing reflections and evaluation

Unit Reflections

In keeping an ongoing record, consider the following questions. There are further stimulus questions in the unit planning section of *MYP: From principles into practice.*
Students and teachers
What did we find compelling? Was our disciplinary knowledge/skills challenged in any way?
What inquiries arose during the learning? What, if any, extension activities arose?
How did we reflect - both on the unit and on our own learning?
Which attributes of the learner profile were encouraged through this unit? What opportunities were there for student-initiated action?

Possible connections
How successful was the collaboration with other teachers within my subject group and from other subject groups?
What interdisciplinary understandings were or could be forged through collaboration with other subjects?

Assessment
Were students able to demonstrate their learning?
How did the assessment tasks allow students to demonstrate the learning objectives identified for this unit? How did I make sure students were invited to achieve at all levels of the criteria descriptors?
Are we prepared for the next stage?

Data collection
How did we decide on the data to collect? Was it useful?

MYP unit planner

Stage 1: Integrate significant concept, area of interaction and unit question

Area of interaction focus

Which area of interaction will be our focus? Why have we chosen this?

- Health and Social Education
- Environments

because these AOIs help students to answerthe following questions:1. what kind of medicine is best for me? Am Itakinging excess dosages and harming my ownhealth.2. how much medicine is best for me? how canI determine the quantity?3. what should I do to keep my next generationlive healthyier and happier

Significant concept(s)

What are the big ideas? What do we want our students to retain for years into the future?

Various susbstances of same mass and volume has different number of particles in it.
(What is enough for me may not be enough for you)

MYP Unit Question

How much is enough? (Significant concept: what is enough for you may not be enough for me)

Assessment

What task(s) will allow students the opportunity to respond to the unit questions?
What will constitute acceptable evidence of understanding? How will students show what they have understood?

class test on chemical quantities.
Formative: Peer Assessment
This assesment is enforce the idea of mole and chemical formula, and a peer assesment is choose, so that the students can observe the error of others, to conceptualise the problem in hand better.

Assignment on percentage composition
Formative: Self Assessment
to understand the conceptualisation of percentage of a particular element in a given compound.

MYP Objectives

Which specific MYP objectives will be addressed during this unit?

IB Expectations/ Assessment Criteria

Which MYP assessment criteria will be used?

Stage 2: Backward planning: from assessment to the learning activities through inquiry.

Content

What knowledge and/or skills (from the course overview) are going to be used to enable the student to respond to the guiding question?
What (if any) state, provincial, district, or local standards/skills are to be addressed?
How can they be unpacked to develop the significant concept(s) for stage 1?

Approaches to Learning

How will this unit contribute to the overall development of subject-specific and general approaches to learning skills?

Learning Experiences	Strategies / Activities / Differentiation
How will students know what is expected of them? Will they see examples, rubrics, templates? How will students acquire the knowledge and practise the skills required? How will they practise applying these? Do the students have enough prior knowledge? How will we know?	How will we use formative assessment to give students feedback during the unit? What different teaching methodologies will we employ? How are we differentiating teaching and learning for all? How have we made provision for those learning in a language other than their mother tongue? How have we considered those with special educational needs?

Resources

What resources are available to us?
How will our classroom environment, local environment and/or the community be used to facilitate students' experiences during the unit?

Ongoing reflections and evaluation

Unit Reflections

In keeping an ongoing record, consider the following questions. There are further stimulus questions in the unit planning section of *MYP: From principles into practice.*

Students and teachers

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How did we reflect - both on the unit and on our own learning?
Which attributes of the learner profile were encouraged through this unit? What opportunities were there for student-initiated action?

Possible connections

How successful was the collaboration with other teachers within my subject group and from other subject groups?
What interdisciplinary understandings were or could be forged through collaboration with other subjects?

Assessment
Were students able to demonstrate their learning?
How did the assessment tasks allow students to demonstrate the learning objectives identified for this unit? How did I make sure students were invited to achieve at all levels of the criteria descriptors?
Are we prepared for the next stage?

Data collection
How did we decide on the data to collect? Was it useful?

MYP unit planner

Stage 1: Integrate significant concept, area of interaction and unit question

Area of interaction focus

Which area of interaction will be our focus? Why have we chosen this?

- Community and Service

because the above AOI along with ATLs willhelp the students to answer the followingquestions:How do I know that how fast the reaction is ?How do I communicate my understanding ofreaction rate?What tools can I use to measure how fast orslow a reaction is?How do I know I have learned the concept theconcept of dynamic equilibrium ?Why and how do we create more products forsome industrially important products byaltering various parameters?What are the consequences if I alter someexternal factors a specific reaction?

Significant concept(s)

What are the big ideas? What do we want our students to retain for years into the future?

conversion of reactants to products is external factor dependent, but sometimes it may not reach product side completely

MYP Unit Question

How far and how fast a reaction reached?

Assessment

What task(s) will allow students the opportunity to respond to the unit questions?
What will constitute acceptable evidence of understanding? How will students show what they have understood?

worksheet to calculate rate of reaction
Formative: Other Written Assessment
in this reaction students were provided with a case-study of a reaction and some data are plotted in graphical or numerical form for the purpose of calculation the rate of reaction. This simulating worksheet is used for the student for their better visualisation of the reaction.

worksheets 2-4: Rate calculation
Formative: Open-Ended Task

These series of open-ended simulation data were provided to them for their processing and for understanding various way of calculating rates of reaction using graphical, and other numerical methods.

Design Lab: of finding percentage of calcium carbonate in egg-shell
Formative: Lab Assignment
in this assignment students, have planned an experiemnts to testify the percentage of calcium carbonate in a sample of given egg-shell. they formulated various hypothesis and tried them in the lab to understand how practical reallife problems can be solved by chemical ways.

Criteria-C: test
Summative: Lab Assignment
a classtest on kinetics and calculating rate of reaction

MYP Objectives

Which specific MYP objectives will be addressed during this unit?

MYP: Arts (For use from Jan./Sept. 2009), MYP Year 5, C Reflection & evaluation
At the end of the course, students should be able to:

- reflect critically on their own artistic development and processes at different stages of their work
- evaluate their work
- use feedback to inform their own artistic development and processes.

MYP: Sciences (For use from Sept. 2010/Jan. 2011), MYP Year 5, C Knowledge & understanding of science
At the end of the course, students should be able to:

- recall scientific knowledge and use scientific understanding to construct scientific explanations
- apply scientific knowledge and understanding to solve problems set in familiar and unfamiliar situations
- critically analyse and evaluate information to make judgments supported by scientific understanding.

MYP: Sciences (For use from Sept. 2010/Jan. 2011), MYP Year 5, D Scientific inquiry
At the end of the course, students should be able to:

- state a focused problem or research question to be tested by a scientific investigation
- formulate a testable hypothesis and explain it using scientific reasoning
- design and carry out scientific investigations that include variables and controls, material and/or equipment needed, a method to be followed and the way in which the data is to be collected and processed
- evaluate the validity and reliability of the method

- judge the validity of a hypothesis based on the outcome of the investigation
- suggest improvements to the method or further inquiry, when relevant.

MYP: Sciences (For use from Sept. 2010/Jan. 2011), MYP Year 5, E Processing data
At the end of the course, students should be able to:

- collect and record data using units of measurement as and when appropriate
- organize, transform and present data using numerical and visual forms
- analyse and interpret data
- draw conclusions consistent with the data and supported by scientific reasoning.

MYP: Sciences (For use from Sept. 2010/Jan. 2011), MYP Year 5, F Attitudes in science
During the course, students should be able to:

- work safely and use material and equipment competently
- work responsibly with regards to the living and non-living environment
- work effectively as individuals and as part of a group by collaborating with others.

IB Expectations/ Assessment Criteria

Which MYP assessment criteria will be used?

MYP: Sciences (For use from Sept. 2005/Jan. 2006), MYP Year 5, Assessment Criteria
Criterion C: knowledge and understanding of science

- The student explains scientific ideas and concepts and applies scientific understanding to solve problems in familiar and unfamiliar situations.
- The student analyses and evaluates scientific information by making scientifically supported judgments about the information, the validity of the ideas or the quality of the work.

Criterion D: scientific inquiry

- The student defines the purpose of the investigation, formulates a testable hypothesis and explains the hypothesis using scientific reasoning.
- The student identifies the relevant variables and explains how to manipulate them.
- The student evaluates the method commenting on its reliability and/or validity.
- The student suggests improvements to the method and makes suggestions for further inquiry when relevant.

Criterion E: processing data

- The student organizes and transforms data into numerical and diagrammatic forms and presents it logically and clearly,

using appropriate communication modes.

- The student explains trends, patterns or relationships in the data, comments on the reliability of the data, draws a clear conclusion based on the correct interpretation of the data, and explains it using scientific reasoning.

Criterion F: attitudes in science

- The student works largely independently; uses equipment with precision and skill; pays close attention to safety and deals responsibly with the living and non-living environment.
- The student consistently works effectively as part of a team, collaborating with others and respecting their views.

Stage 2: Backward planning: from assessment to the learning activities through inquiry.

Content

What knowledge and/or skills (from the course overview) are going to be used to enable the student to respond to the guiding question?
What (if any) state, provincial, district, or local standards/skills are to be addressed?
How can they be unpacked to develop the significant concept(s) for stage 1?

students are expected to learn the following:
what is meant by the term 'speed' of reaction
various types of reaction classified as slow, fast and moderate, and they are relative to each other
how to measure the rate of a reaction
by product formation method (mass method)
gas collection method
reactant loss method (mass method)
various factors which affects the reaction rate
reversible and irreversible types of reactions and their similarities and differences
dynamic equilibrium is a state where reactions aparently stops ...
factors that affects the equilibrium
case studies of ammonia and sulphuric acid production

student should know how to calculate the speed of a reaction they should use it and twick it for the benefit of society how to increase production of some very important industrial chemical preparation understanding why we should know how far and how fast the reaction is taking place to prevent various poisoning and polluting effects.

Approaches to Learning

How will this unit contribute to the overall development of subject-specific and general approaches to learning skills?

- Collaboration
- Reflection
- Thinking
- Transfer

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students prior knowledge is tested with "pre-post test" students were given basic worksheet, so that they can see the simulated data for that purpose, which tells them how the reaction progresses without doing a lab as well as they teaches them how to use the data to find the meaningful information for the profit of the society	differentiation is done by providing higher order question for the gifted one, where as a simple case study based worksheet was given for the students who are little weak.

Resources

What resources are available to us?
How will our classroom environment, local environment and/or the community be used to facilitate students' experiences during the unit?

various simulation to illustrate state of equilibrium
flash movies on rate of reaction and its various collection methods
web-online test
worksheets for calculation of rate and equilibrium values

powerpoint to guide thru the topic in the classroom

Ongoing reflections and evaluation

Unit Reflections

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